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ABSTRACT

"Test preparation" activities can range from simple practice to in-depth instruction, but most of these activities use some form of test familiarization, drill and practice with feedback, training in strategies for specific item types, and general test-taking, subject-matter review, and skill development exercises. Two experiments were conducted to study the effects of test preparation on results from the American College Testing program (ACT) Assessment. In the first experiment, a random sample of 10% was selected from one students who took the ACT between October 1, 1994 and September 20, 1995 (69,251 students). These students had answered test preparation questions as part of the information they supplied for the ACT. Gender, ethnic/racial, and family income differences in test preparation were also examined. Almost half of the students had engaged in some form of test preparation, with lower income and minority students reporting engaging in combinations of activities more than other student groups. The types of test preparation studied had little impact on student performance, with only practice tests showing a positive, although small, impact. The second study considered students who had taken the ACT more than once in the time period of the previous study. The sample consisted of 126,253 repeaters. The same information was obtained and the same analyses performed. Over half of these repeat test takers engaged in some type of test preparation before the second ACT, but results suggest that test preparation activities have only a minimal impact on increasing the second ACT Assessment scores beyond gains from simply retaking the test. Results overall suggest that test preparation activities have little impact on scores. (Contains six tables and eight references.) (SLD)

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The Effects of Test Preparation Activities on ACT Assessment Scores

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Paper presented at the Annual Meeting of the American Educational Research Association, March, 1997, Chicago, IL

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The Effects of Test Preparation Activities on ACT Assessment Scores

During recent years, interest has increased in better preparing students to take various tests and assessments that are used to make important educational decisions. In response to this interest, test developers, educational organizations, and businesses have introduced a variety of instructional materials and courses to assist students with improving their test performance. It has been estimated that approximately 85% of secondary schools currently offer some type of test preparation instruction (Haney, W.M., Madaus, G.F., & Lyons, R., 1993) and many universities now offer test preparation courses. In addition, a near billion-dollar industry of test preparation schools has developed and is offered to nearly anyone seeking assistance (Lauderdale, V.B., 1989).

"Test preparation," sometimes referred to as "coaching," is commonly defined as "the utilization of an aid or tool by a test-taker to acquire information and techniques for the purpose of attaining the highest score possible on a test" (Stockwell, J.S., Schaeffer, R., & Lowenstein, J., 1991, p. 3). Test preparation activities can range from simple practice to in-depth instruction. Most of these activities entail some combination of test familiarization, drill and practice with feedback, training in strategies for specific item formats and general test taking, subject-matter review, and/or skill development exercises. Test preparation activities can be presented in practice test booklets, workbooks, or test preparation courses.

Many parents, teachers, and school counselors believe test preparation activities are beneficial for at least some students. However, the results of research that has investigated the effectiveness of test preparation activities for increasing test

scores have been mixed. Kulik, Kulik, and Bangert (1984) performed a meta-analytic synthesis of findings from 40 studies and concluded that students can raise their scores on aptitude and achievement tests by taking practice forms of the tests. However, Becker (1990) analyzed results of studies in 23 reports on coaching for the SAT and found that not all test preparation is effective and that all studies of coaching do not provide similar views of coaching's effectiveness.

A number of factors affect the utility of test preparation activities including the objectives of the activities, the approach taken, and the students' educational backgrounds. Test preparation activities that are designed to help students develop test-taking strategies or to increase familiarity with how the tests are administered may be useful if students are inexperienced in taking standardized tests. Short-term test preparation programs that emphasize the review and recollection of information previously learned may be helpful to students if considerable time has elapsed since students completed course work that covers the content of the tests. The usefulness of test preparation activities also seems to depend on the test itself.

A large portion of test preparation activities is directed toward tests, such as the SAT and ACT Assessment, that are typically used in "high-stakes" college admissions and placement decisions. Studies that examined the effectiveness of test preparation activities on scores from college admissions tests have, for the most part, been conducted with SAT scores and results have not demonstrated a clear pattern of findings.

Research that has investigated the relationship between test preparation and

ACT scores has been relatively limited in spite of the fact that nearly one-million students complete the ACT Assessment each year and that there are many workbooks, computer software, and test preparation courses on the market designed to help these students increase their scores. However, a few studies have tried to examine this relationship. Lauderdale (1989) examined the effectiveness of Krell ACT preparation software that simulates the ACT test format. Participants were college preparatory and honors junior high school students (N=57). Half of the students used the Krell software for a minimum of 7 hours and the other students had no preparation. The results of the study showed no significant differences between groups on ACT subtest scores. The author did not report the results for ACT Composite scores.

Seaton (1992) studied 30 high school female juniors who participated in a 10-hour preparation program for the ACT Assessment. The pretest consisted of retired copies of the ACT Assessment, and the posttest was the current ACT Assessment. The mean score for the pretest was 19 (SD=2.9) and the mean score for the posttest was 23 (SD=3.3). However, since a control group was not used in the study, it is impossible to determine if the gain from pretest to posttest was due to the test preparation program or from the exposure to the pretest.

Rainey (1996) investigated the effectiveness of a college test preparation course on ACT Assessment scores. The mean Composite score of the 30 coached students was 17.5 (SD=4.8) while the mean score of the 30 non-coached students was 18.2 (SD=4.1). Since the participants in this study were from one Chicago high school, the

results may not generalize well to all high school students.

Other studies on coaching for college admissions tests have found no need for a student to be coached if the student has done what was expected in the classroom during their high school education (Rainey, 1996).

In summary, the results of these studies that examined the effects of test preparation activities on ACT Assessment scores have been inconclusive. Therefore, the purpose of this study was to examine how students prepare for the ACT Assessment and to determine if the preparation helps. The questions to be answered were: 1) How do students prepare for the ACT Assessment? 2) Are there differences in preparation among ethnic, gender, or income groups? 3) What effects do selected test preparation activities have on ACT Assessment scores? and 4) Do certain groups of students benefit more than others from test preparation activities?

To answer these questions we studied student-reported test preparation activities, ACT Composite scores, and characteristics of two different samples of ACT-tested students.

Experiment 1

Method

Participants. A random sample of 10% was selected from the ACT-tested population that tested between October 1, 1994 and September 20, 1995. Only students who took the test once during that period and did not previously test during the 1993-94 test year remained in the data set. In addition, students who tested under special testing conditions were eliminated as were students with invalid

or missing data. Thus, 69,251 students were retained in the data set. Fifty-six percent of the students were female and 74% were Caucasian American/White.

Procedures. Information on students' gender, ethnic/racial background, grade level, family income, self-reported grades for courses, ACT test scores, and responses to four items that inquired about test preparation activities were selected from ACT Assessment history files. The four test preparation items asked students if they had spent *two or more hours* on one or more of the following: taking practice tests, using workbooks, taking a test preparation course, or engaging in any other type of preparation. Since we could not define what "other" types of preparation activities were, information from this item was not considered for analyses. An estimated high school grade average, based on self-reported grades, was calculated for each student. Table 1 presents the mean GPA and percentages of students by grade level and gender for each test preparation group and for the total sample.

Data Analysis

Cross-tabulations were performed to examine gender, ethnic/racial, and family income differences in test preparation activities. To examine the impact of test preparation activities, a one-way ANOVA was performed for each type of test preparation activity controlling for the effects of GPA and grade level. ACT Composite scores served as the dependent variable. To determine if test preparation differentially impacted gender, racial/ethnic, or family income groups, two-way ANOVAs, controlling for GPA and grade level, were performed for each type of test preparation activity with ACT Composite again serving as the dependent variable.

Due to the large sample size, the criterion set for rejection of the null hypotheses was $\alpha = .0001$.

Results

Test Preparation Activity. Table 2 presents test preparation activity by ethnic/racial, gender, and family income groups. Few differences were observed in the percentages of students in each racial/ethnic group who reported using practice tests, workbooks, or who took a test preparation course. However, a higher percentage of African-Americans/Blacks (48%) reported engaging in more than one activity than did the students from other racial/ethnic groups. Only 31% of Caucasian Americans/Whites reported using more than one type of preparation. Similarly, few differences were observed in the percentages of students in each family income group who reported using practice tests, workbooks, or who took a test preparation course. On the other hand, a higher percentage of students who reported a family income of less than $18,000 reported engaging in more than one activity than did the students from other family income groups. In addition, a slightly higher percentage of females reported using practice tests, workbooks, and engaging in more than one activity than did males.

Impact of Test Preparation Activities. Table 3 presents group mean ACT Composite scores, adjusted mean ACT Composite scores, and mean differences between those who had prepared and those who did not for each type of test preparation. Students who reported taking practice tests had a higher mean GPA than students in the other test preparation groups. This group also benefited more

from their type of preparation than those who reported other types of preparation. However, the difference between those who used practice tests and those who did no preparation was only 0.4 ACT Composite score units (equivalent to an effect size of less than .1). The difference in means for those who used workbooks, took a prep course, or did any type of preparation compared to those who did not prepare was -0.6 scale score units. All of these differences were statistically significant ($p < .0001$).

Effect of Test Preparation Activities by Student Subgroups. Results of the two-way ANOVA's indicated the impact of test preparation activities on ACT Composite scores was nearly the same regardless of gender, ethnicity/race, family income, or high school GPA. The only exception was a significant interaction that emerged in the analysis performed on ethnicity/race by any type of preparation. The difference in adjusted mean scores between those who engaged in any type of preparation and those who did not was -0.3 for Caucasian Americans/White but was -1.0 for American Indians/Alaskan Natives. The differences between mean scores for the other ethnic/racial groups was -0.6 for African Americans/Blacks, -0.7 for Mexican Americans/Chicanos, -0.7 for Asian-Americans/Pacific Islanders, and -0.8 for Puerto Ricans, Cubans, or Other Hispanics.

Discussion

Several interesting findings emerged from the analyses of the data from first-time test takers. Almost one-half of ACT-tested students engage in some type of test preparation before taking their first ACT Assessment, with lower income and

minority students reporting engaging in combinations of activities more than other student groups. In general, the types of test preparation activities we studied had minimal impact on students' performance on ACT Composite scores. Only practice tests had a positive, but small, impact on scores.

The types of preparation activities studied here did not help certain groups of students more than others but for one exception. The negative difference between those who did any type of preparation and those who did not prepare was smaller for Caucasian Americans/Whites than other racial/ethnic groups. An examination of high school GPAs by ethnic group shows that, for all ethnic/racial groups, GPAs are higher for those in the "no preparation" group than for the "any type of preparation group." However, the discrepancy between GPAs was higher for Native American/Alaskan Natives than for Caucasian Americans/Whites. Even though we controlled for the effects of GPA in all analyses, it may be that the GPA differences between groups were not totally equalized in the analyses. According to Lord (cited in Howell, D. C., 1987, p. 540), when using a nonequivalent groups design, "there is no statistical procedure that can be counted on to make proper allowances for uncontrolled pre-existing differences between groups." It is also possible that GPA is an indicator of the effects of another variable that is making the "any prep" versus "no prep" groups uneven.

The results of the study suggest that engaging in the types of test preparation activities studied here, on average, will not yield large gains in ACT scores.

Experiment 2

Method

Participants. All students who had taken the ACT Assessment more than once between October 1, 1994, and September 20, 1995, were selected for inclusion in the study. Students who tested under special testing conditions were eliminated as were students with invalid or missing data. To avoid possible confounding effects, students who had engaged in test preparation activities before their first testing were eliminated. These procedures yielded a sample of 126,253 repeat testers. Fifty-nine percent of the sample were female and 72% were Caucasian Americans/Whites.

Procedures. The same information that was selected from ACT Assessment history files for the first study was also selected for this study. In addition, we selected student responses to the same four items as the first study that inquired about test preparation activities before the second ACT Assessment and ACT test scores from students' second testing. The percentages of students by grade level and gender and sample mean GPAs by type of preparation and for the total sample are presented in Table 4.

Data Analysis

The same analyses that were performed in the first study were performed in this study. We ran an additional two-way ANOVA to determine if test preparation differentially impacted students in different score ranges from the first test. The dependent variable for all analyses was the mean score increase from the first to the second testing. In addition, as with the first study, we controlled for GPA and grade

level, and the criterion set for rejection of the null hypotheses was $\alpha = .0001$.

Results

Test Preparation Activity Before the Second ACT Assessment. Table 5 presents test preparation activity by ethnic/racial, gender, and family income groups. The results were very similar to the results from the first study. Few differences were observed in the percentages of students in each racial/ethnic group who reported using practice tests, workbooks, or who took a test preparation course. However, a higher percentage of African-Americans/Blacks (54%) reported engaging in more than one activity than did the students from other racial/ethnic groups. Asian-Americans/Pacific Islanders were the group with the next highest percentage of using more than one type of preparation (47%). Only 35% of Caucasian Americans/Whites reported they used more than one type of test preparation.

Similarly, few differences were observed in the percentages of students in each family income group who reported using practice tests, workbooks, or who took a test preparation course. Again, a higher percentage of students who reported a family income of less than $18,000 (44%) reported engaging in more than one activity than did the students from other family income groups. In addition, a slightly higher percentage of females reported using practice tests and taking a preparation course than did males. There were no differences between gender groups in the percentages of those who used more than one type of test preparation.

Impact of Test Preparation Activities. Table 6 presents group means for first and second ACT Composite scores, mean score increases from first to second testings,

and adjusted score increases. The mean increase in scores from the first to the second testing for students who did no preparation was 0.6. The mean score increases for the practice tests, workbooks, and any type of preparation groups were 0.8. The mean score increase for the preparation course group was 0.6, or the same as those who did not prepare. Students who used practice tests, workbooks, or engaged in any type of preparation only gained 0.2 adjusted ACT Composite score units more than those who indicated they did not prepare. Although the differences in means between those who engaged in those three types of preparation activities and those who did not prepare were statistically significant ($p < .0001$), the magnitude of the difference was minimal (effect size < .1).

Effect of Test Preparation by Student Subgroups. No significant interactions were found for test preparation by ethnicity/race, gender, financial background, GPA, or how the student scored on the first test. These results were similar to those of a 1985 study by Samson (cited in Seaton, T., 1992) who investigated the relationship between test preparation programs and several student characteristics. No significant differences were found from sub-group to sub-group for gender, ethnic background, socioeconomic level, geographic area of the country, or type of community.

Discussion

Over one-half of repeat testers engage in some type of test preparation before taking their second ACT Assessment, with lower income and minority students reporting engaging in combinations of activities more than other student groups. The

results suggest that test preparation activities such as those studied here have only a minimal impact, on average, on increasing second ACT Assessment scores beyond the gains that occur from simply retaking the test. The results were the same regardless of gender, race/ethnicity, family income, or score on the first test.

Conclusion

The results of both studies showed that slightly less than half of ACT-tested students engage in some type of test preparation before their first ACT Assessment. In addition, over half of test repeaters engage in some type of test preparation before taking their second ACT Assessment. Minority and lower family income groups reported engaging in more than one preparation activity than other student groups. Some believe the effectiveness of test preparation courses reinforces biases against low-income and minority students because these test-takers are unable to afford the courses (Stockwell, et. al., 1991). However, we found that these groups reported engaging in the types of preparation studied here at least as much or more than higher family income groups or Caucasian/Whites.

The results of both studies also suggest that the test preparation activities studied here have little effect, on average, on increasing ACT scores whether or not the preparation was before a first or a second testing. These results are similar to those from the Lauderdale (1989) and Rainey (1996) studies. However, the results should be interpreted with caution.

Given the general nature of the variables studied, we were unable to address other factors, such as length or content of the test preparation activity, that may effect

the usefulness of the activity. Samson (cited in Seaton, T., 1992), in a synthesis of the effects of test preparation seminars on achievement test performance, concluded that length of test preparation programs had a great effect on student achievement.

Another limitation to these studies is that because it was not possible to randomly assign groups, students self-selected into the "prep" and "no prep" groups. Even though we attempted to control for high school GPA and grade level, other potential selection factors that were not measured might have affected the results.

In addition, much of the data used was self-reported and may have contained some error. Specifically, we do not know the accuracy of the self-reported test preparation activities. However, preliminary results from an ACT research project in progress show that for approximately 70% of the cases studied, self-reported data for grades was 100% accurate. We do not know if the accuracy for self-reported test preparation activities is similar, but we also do not have reason to believe it is not.

From the results of these studies, we can begin to understand the relationship between test preparation and ACT scores. However, continued research is needed in order to deepen our understanding of the effects of test preparation.

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Table 1

Demographic Information by Test Preparation Group and for the Total Sample

Group	n	Mean GPA	% of Males	% of Females	% of Juniors	% of Seniors	% in Other Grade Levels
Practice Tests	7,559	3.17	38	62	58	34	8
Workbooks	1,848	3.02	39	61	50	42	8
Prep Course	1,400	3.08	42	58	59	35	6
Any Prep[a]	33,855	3.05	41	59	55	37	8
No Preparation	35,396	3.07	47	53	51	43	6
Total Sample	69,251	3.06	44	56	53	40	7

[a]This category consists of students who did one of the specific types of preparation and those that engaged in combinations of activities.

Table 2

Test Preparation Activity by Ethnicity/Race, Gender, and Family Income Groups

Group	n	Type of Test Preparation: One Type of Activity: Practice Tests	Workbooks	Prep Course	Total	More Than One Type of Activity	No Preparation Activity
Ethnicity/Race							
African Am./ Black	6,769	583 (9%)	239 (4%)	158 (2%)	980 (15%)	3,282 (48%)	2,507 (37%)
Am. Indian/ Alaskan Nat.	852	89 (10%)	17 (2%)	22 (3%)	128 (15%)	317 (37%)	407 (48%)
Caucasian Am./White	50,900	5,779 (11%)	1,274 (3%)	1,008 (2%)	8,061 (16%)	15,633 (31%)	27,206 (53%)
Mexican-Am./ Chicano	1,702	168 (10%)	56 (3%)	35 (2%)	259 (15%)	605 (36%)	838 (49%)
Asian-Am./ Pacific Islander	2,019	236 (11%)	60 (3%)	39 (2%)	335 (16%)	763 (38%)	932 (46%)
Pr. Ric., Cuban, Oth. Hispanic	2,142	233 (11%)	66 (3%)	41 (2%)	340 (16%)	758 (35%)	1,044 (49%)
Other/Prefer Not to Respond	3,204	334 (10%)	90 (3%)	63 (2%)	487 (15%)	1,147 (36%)	1,570 (46%)
Gender							
Males	30,372	2,839 (9%)	713 (3%)	589 (2%)	4,141 (14%)	9,686 (32%)	16,545 (54%)
Females	38,879	4,720 (12%)	1,135 (3%)	811 (2%)	6,666 (17%)	13,362 (34%)	18,851 (49%)
Family Income							
< $18,000	10,517	1,112 (11%)	330 (3%)	207 (2%)	1,649 (16%)	4,141 (39%)	4,727 (45%)
$18 - $30,000	11,122	1,232 (11%)	311 (3%)	196 (2%)	1,739 (16%)	3,867 (35%)	5,516 (49%)
$30 - $50,000	19,115	2,192 (11%)	490 (3%)	381 (2%)	3,063 (16%)	6,078 (32%)	9,974 (52%)
> $50,000	22,111	2,355 (11%)	540 (2%)	478 (2%)	3,373 (15%)	6,914 (31%)	11,824 (54%)

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Table 3

Mean ACT Composite Scores, Adjusted Mean ACT Composite Scores, and Difference Scores Between Type of Test Preparation and No Preparation

Group	n	ACT Composite Score[a] M	ACT Composite Score[a] SD	Adjusted ACT Composite Score[b] M	Difference From No-Prep Group Mean
Practice Tests	7,559	21.5	4.6	21.2	0.4
Workbooks	1,848	20.0	4.5	20.2	-0.6
Prep Course	1,400	20.3	4.5	20.2	-0.6
Any Preparation[c]	33,855	20.2	4.6	20.2	-0.6
No Preparation	35,396	20.8	4.5	20.8	N/A

[a]ACT Composite scale score range is 1 - 36.

[b]Means are adjusted for the effects of high school GPA and grade level.

[c]Comprises students who did one of the specific types of preparation and those that engaged in combinations of preparation activities.

Table 4

Demographic Information by Test Preparation Group

and for the Total Sample for Repeat Testers

Group	n	Mean GPA	% of Males	% of Females	% of Juniors	% of Seniors	% in Other Grade Levels
Practice Tests	8,922	3.28	36	64	43	55	2
Workbooks	3,974	3.25	36	64	35	63	2
Prep Course	3,071	3.30	36	64	46	52	2
Any Prep[a]	64,757	3.19	40	60	37	61	2
No Preparation	61,496	3.24	43	57	37	61	2
Total Sample	126,253	3.22	41	59	37	61	2

[a]This category consists of students who did one of the specific types of preparation and those that engaged in combinations of activities.

Table 5

Test Preparation Activity by Ethnicity/Race, Gender,

and Family Income Groups for Repeat Testers

Group	n	Type of Test Preparation					
		One Type of Activity				More Than One Type of Activity	No Preparation Activity
		Practice Tests	Workbooks	Prep Course	Total		
Ethnicity/Race							
African Am./ Black	16,930	942 (6%)	626 (4%)	396 (2%)	1,964 (12%)	9,113 (54%)	5,853 (34%)
Am. Indian/ Alaskan Nat.	1,802	113 (6%)	50 (3%)	43 (2%)	206 (11%)	725 (40%)	871 (49%)
Caucasian Am./White	90,817	6,737 (7%)	2,755 (3%)	2,258 (3%)	11,750 (13%)	31,846 (35%)	47,201 (52%)
Mexican-Am./ Chicano	1,773	119 (7%)	52 (3%)	38 (2%)	209 (12%)	676 (38%)	888 (50%)
Asian-Am./ Pacific Islander	3,880	299 (8%)	149 (4%)	81 (2%)	529 (14%)	1,828 (47%)	1,523 (39%)
Pr. Ric., Cuban, Oth. Hispanic	2,474	188 (8%)	94 (4%)	55 (2%)	337 (14%)	1,033 (42%)	1,104 (44%)
Other/Prefer Not To Respond	4,348	297 (7%)	126 (3%)	89 (2%)	512 (12%)	1,882 (43%)	1,954 (45%)
Gender							
Males	51,958	3,231 (6%)	1,435 (3%)	1,107 (2%)	5,773 (11%)	20,074 (39%)	26,111 (50%)
Females	74,295	5,691 (8%)	2,539 (3%)	1,964 (3%)	10,194 (14%)	28,716 (39%)	35,385 (47%)
Family Income							
< $18,000	17,230	1,155 (7%)	538 (3%)	317 (2%)	2,010 (12%)	7,628 (44%)	7,592 (44%)
$18 - $30,000	20,273	1,446 (7%)	686 (3%)	468 (2%)	2,600 (12%)	7,828 (39%)	9,845 (49%)
$30 - $50,000	36,325	2,713 (7%)	1,145 (3%)	812 (2%)	4,670 (12%)	13,274 (37%)	18,381 (51%)
> $50,000	40,853	2,814 (7%)	1,269 (3%)	1,174 (3%)	5,257 (13%)	15,613 (38%)	19,983 (49%)

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Table 6

Mean 1st and 2nd ACT Composite Scores, Gain Scores from 1st to 2nd Testing, and Adjusted Gain Scores For Repeat Testers

Group	n	1st ACT Composite Score M	1st ACT Composite Score SD	2nd ACT Composite Score M	2nd ACT Composite Score SD	Gain Score M	Gain Score SD	Adj. Gain Score[a] M	Gain Over No Prep[b]
Practice tests	8,922	20.5	4.4	21.4	4.5	0.9	1.6	0.8	0.2
Workbooks	3,974	20.2	4.5	21.0	4.6	0.8	1.6	0.8	0.2
Prep Course	3,071	20.7	4.3	21.3	4.5	0.7	1.6	0.6	0
Any Preparation[c]	64,757	19.6	4.3	20.3	4.5	0.8	1.6	0.8	0.2
No Preparation	61,496	20.7	4.4	21.2	4.5	0.6	1.6	0.6	N/A

[a]Means are adjusted for the effects of GPA and grade level.

[b]Type of preparation gain score minus the no preparation gain score.

[c]Comprises students who did one of the specific types of preparation and those that engaged in combinations of activities.